U.S. Department of Energy's
Office of Science

Review Committee Report

NuMi Off-Axis Neutrino Appearance (NOνA) Experiment

Daniel R. Lehman, Chairperson
DOE/SC Review Committee
October 23-25, 2007
http://www.science.doe.gov/opa/

U.S. Department of Energy

Office of Science

DOE Review of NOνA

DOE EXECUTIVE SESSION AGENDA

Tuesday, October 23, 2007 – ANL Bldg 360, Rm. A-224

8:00 a.m.	Introduction and Overview	D. Lehman
8:10 a.m.	SC Perspective	M. Procario
8:20 a.m.	Site Office Perspective	P. Carolan
8:35 a.m.	Questions/Discussion	D. Lehman
8:45 a.m.	Adjourn	

U.S. Department of Energy

Office of Science

Review Committee Participants

Department of Energy Review of the
NuMI Off-Axis Neutrino Appearance (NOvA) Experiment
October 23-25, 2007

Daniel R. Lehman, DOE, Chairperson

SC1
Commodities: PVC/Fiber/ Scintillator

* Richard Hahn, BNL
Jim Proudfoot, ANL
Bill Louis, LANL

SC2
PVC Extrusion Module & Near/Far Detector Assembly

* Bill Wisniewski, SLAC
Dick Loveless, U. of Wisconsin
Jim Krebs, SLAC
Martin Nordby, SLAC

SC3
Electronics and Data Acquisition

* Andy Lankford, UC Irvine
John Haggerty, BNL
Rick Van Berg, Penn

SC4
Accelerator and Beamlines

* Rod Gerig, ANL
Fulvia Pilat, BNL
Graeme Murdoch, ORNL

SC5
Sites and Buildings

* Jim Lawson, ORNL
Ove Dyling, BNL
David Saenz, SLAC

SC6
ES&H

* Steve Trotter, ORNL

SC7
Cost, Schedule, and Funding

* Barb Thibideau, ORNL
Steve Tkaczyk, DOE/SC

SC8
Management

* Murdock Gilchriese, LBNL
David Dale, BNL
Scott Mallette, DOE/TJSO
Gail Penny, DOE/BHSO

Observers

Mike Procario, SC-25
Pepin Carolan, DOE/FSO
Steve Webster, DOE/FSO

LEGEND

SC Subcommittee
* Chairperson

Count: 24 (excluding observers)

U.S. Department of Energy

Office of Science

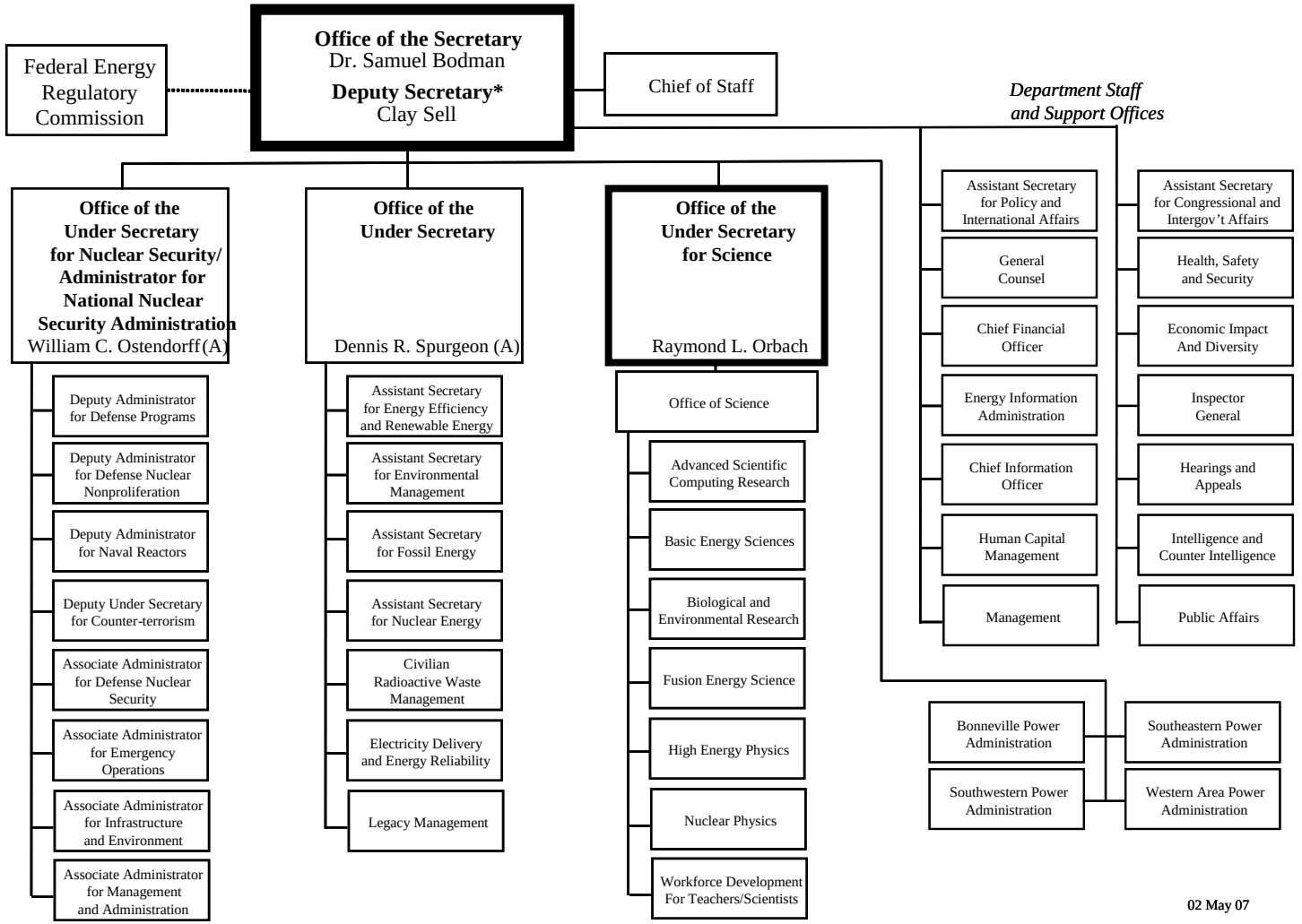
Charge Questions

1. Technical Scope: Review the technical scope in order to assure that the proposed design and associated implementation approach satisfies the performance requirements.
2. Cost Estimates: Is the cost estimate consistent with the plan to deliver the technical scope with the stated performance?
3. Does the project satisfy all 16 lines-of-inquiry?
4. Management: Evaluate the management structure as to its adequacy to deliver the proposed technical scope within specifications, budget, and schedule.
5. Limited Construction: Are the requested long-lead procurements and other construction activities scheduled for FY 2008 necessary to achieve the stated schedule? Have Fermilab and the project done the necessary preparations to execute these activities during FY 2008?
6. Are ES&H aspects being properly addressed and are future plans sufficient given the projects current stage of development?

U.S. Department of Energy

DOE Organization Chart

Office of Science

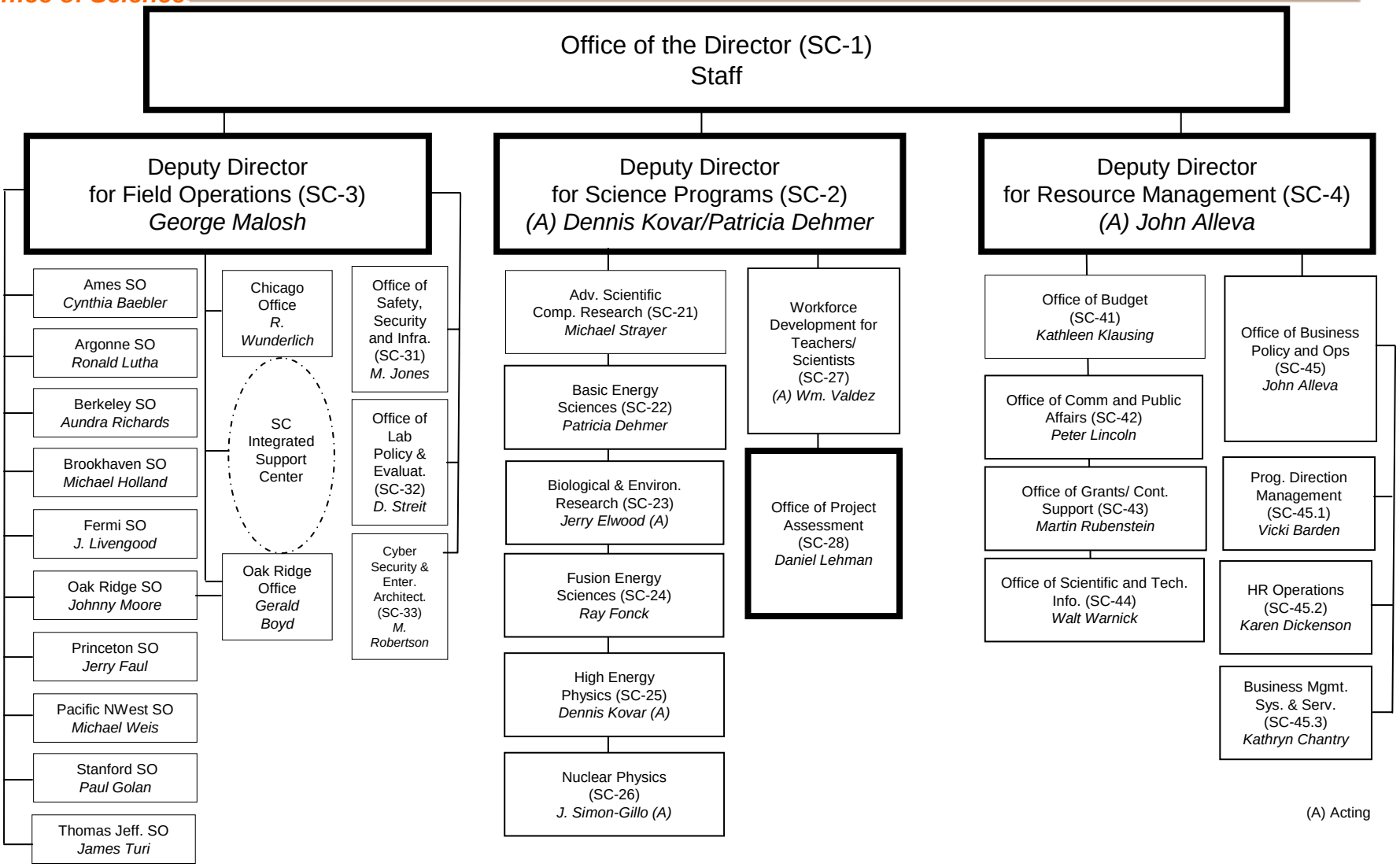


*The Deputy Secretary also serves as the Chief Operating Officer

U.S. Department of Energy

Office of Science

SC Organization Chart



(A) Acting

09/18/2007

DECISION/APPROVAL \ TOTAL PROJECT COST (TPC)			$750M or more	Less than $750M to $400M Delegation Allowed to SC-1 for less than $400M	Less than $400M to $100M	Less than $100M to $20M Delegation Allowed	Less than $20M to $5M
Prior to CD-0, Mission Need Statement			Reviewed by PA&E Approved by SC-1	Reviewed by PA&E Approved by SC-1	Reviewed by PA&E Approved by SC-1	Reviewed by SC-1.3 Approved by SC-1	Reviewed by SC-1.3 Approved by SC-AD
Prior to CD-1, Acquisition Strategy			Reviewed by OECM Approved by SC-1	Reviewed by SC-1.3 Approved by SC-1	Reviewed by SC-1.3 Approved by SC-1	Reviewed by SC-1.3 Approved by SC-1	Reviewed by SC-1.3 Approved by SC-AD
CRITICAL DECISIONS	**CD-0 --**Approve Mission Need		S-2	US-SC	US-SC delegated to **SC-1**	SC-1	SC-AD
	CD-1--Approve Alternative Selection and Cost Range		S-2	US-SC	US-SC delegated to **SC-1**	SC-1 delegated to **SC AD**	PM or SOM if delegated
	CD-2 --Approve Performance Baseline		S-2	US-SC	US-SC delegated to **SC-1**	SC-1 delegated to **SC AD**	PM or SOM if delegated
	CD-3 --Approve Start of Construction		S-2	US-SC	US-SC delegated to **SC-1**	SC-1 delegated to **SC AD**	PM or SOM if delegated
	CD-4 --Approve Start of Operation or Project Completion		S-2	US-SC	US-SC delegated to **SC-1**	SC-1 delegated to **SC AD**	PM or SOM if delegated
BASELINE MANAGEMENT	Deviations		If performance, scope, schedule, or cost baseline at CD-2 cannot be met, the S-2 must be notified & a determination made to terminate the project or establish a new performance baseline. S-2 approval is needed if cumulative change in Performance Baseline of >6 months or >$25M or 25% of Original Cost Baseline at CD-2 or change in scope not meeting the mission need or not in conformance with the Project Execution Plan; or US-SC approval if preceeding threshold is not exceeded; or PSO approval if delegated.				N/A
	New Performance Baseline Approval						N/A
	Directed Change		Project changes caused by DOE Policy Directive, Regulatory, or Statutory action such as changes in approved budget or requirements.				
	Routine Project Changes/ Control	Program	SC-1	SC-1	SC-AD	SC AD	SC AD
		Project	PM, SOM or FPD (Optional)	PM, SOM or FPD (Optional)	PM, SOM or FPD (Optional)	PM, SOM or FPD (Optional)	PM, SOM or FPD (Optional)
		Contractor	Contractor	Contractor	Contractor	Contractor	Contractor
PEP --Project Execution Plan Approval			S-2	US-SC	US-SC delegated to **SC-1**	SC-1 delegated to **SC AD**	PM or SOM if delegated
Site Selection			S-2	S-2	S-2	S-2	N/A
REVIEWS	**EIR** --External Independent Review by OECM		Prior to CD-2 & CD-3	Prior to CD-2	Prior to CD-2	N/A	N/A
	IPR--Independent Project Review by SC-1.3		Prior to CD-0 & CD--3	Prior to CD-3	Prior to CD-3	Prior to CD-2 & CD-3	Optional prior to CD-2 & CD-3
	ORR/RA--Operational Readiness Review/Readiness Assessment by Program		Prior to CD-4	Prior to CD-4	Prior to CD-4	Prior to CD-4	Prior to CD-4
	Design Review*		Prior to CD-1, CD-2, CD-3	Prior to CD-1, CD-2, CD-3	Prior to CD-1, CD-2, CD-3	Prior to CD-1, CD-2, CD-3	Optional
	Technical IPR for Nuclear Facility**		Prior to CD-1	Prior to CD-1	Prior to CD-1	Prior to CD-1	Optional
PARS Reporting (EVMS for Projects >$20 M)			Monthly Project Status After CD-0 and Monthly Project Performance After CD-2				Monthly Project Status After CD-0
QPPR --Quarterly Project Performance Review			Quarterly After CD-0 by SAE/AE				N/A
FPD --Federal Project Director			Appointed by SAE at CD-1	Appointed by AE at CD-1			

AD=Associate Director; AE=Acquisition Executive;l EIR=External Independent Review Conducted by OECM; FPD=Federal Project Director; IPR =Independent Project Review Conducted by SC; ORR=Operationl Readiness Review Conducted by SC; PARS= Project Analysis and Reporting System; PM=HQ Office of Science Program Manager; S-2=Deputy Secretary; SAE=Seceretarial Acquisition Executive; SC=Office of Science; SC-1=Director, Office of Science; SOM=Site Office Manager; US-SC=Under Secretary of Science; *=Design Reviews by individuals external to the project.; **=for high risk, hazard, and Category 1, 2, &3 nuclear facilities only

U.S. Department of Energy

Office of Science

Draft Agenda

Tuesday. October 23, 2007—ANL Bldg Number 362, Auditorium

8:00 am	DOE Executive Session—**Bldg 360, Rm A-224**.....D. Lehman
9:00 am	Plenary Session—**Bldg 362, Auditorium**
9:00 am	Welcome ..... H. Weerts
9.05 am	Fermilab Overview .....P. Oddone
9:10 am	Scientific Performance Requirements.....G. Feldman
9:25 am	Project Overview .....J. Cooper
10:15 am	**Break** —Bldg 362, outside Auditorium
10:40 am	Project Cost Drivers..... R. Ray
11:05 am	Accelerator & NuMI Upgrades..... N. Grossman
11:30 am	Site and Building..... S. Dixon
11:45 am	Scintillator.....S. Mufson
12:00 pm	**Lunch—Bldg 362, Rm E-148**
1:00 pm	Fiber .....C. Bromberg
1:10 pm	PVC Extrusions.....R. Talaga
1:25 pm	Extrusion Modules.....K. Heller
1:50 pm	Near/Far Detector Assembly..... D.Ayres
2:15 pm	Electronics and DAQ .....L. Mualem
2:30 pm	Cost and Schedule Methodology .....W. Freeman
2:50 pm	Working within the TPC Guidance.....J. Cooper
3:00 pm	**Break** – Bldg 362, outside Auditoium

3:30 pm Subcommittee Breakout Sessions

- SC1 Commodities: Scintillator, Fiber, and PVC— Bldg 362, Rm F-240
- SC2 Extrusion Module Production & Near and Far Detector Assembly— Bldg 362, Rm F-108
- SC3 Electronics and DAQ—Bldg 362, Rm E-356
- SC4 Accelerator and Beamlines— Bldg 362, Rm E-188
- SC5 Site and Building— Bldg 362, Rm B-116
- SC6 ES&H— Bldg 362, Rm C-141
- SC7 Cost, Schedule and Funding— Bldg 362, Rm F-253

5:00 pm	DOE Executive Session—**Bldg 360, Rm A-224**.....D. Lehman
6:30 pm	Adjourn

U.S. Department of Energy

Office of Science

Draft Agenda

Wednesday, October 24, 2007

8:00 am Subcommittee Breakout Sessions
- SC1 Commodities: Scintillator, Fiber, and PVC— Bldg 362, Rm F-240
- SC2 Extrusion Module Production & Near and Far Detector Assembly— Bldg 362, Rm F-108
- SC3 Electronics and DAQ— Bldg 362, Rm E-356
- SC4 Accelerator and Beamlines— Bldg 362, Rm E-188
- SC5 Site and Building— Bldg 362, Rm B-116
- SC6 ES&H— Bldg 362, Rm C-141
- SC7 Cost, Schedule and Funding— Bldg 362, Rm F-253
- SC8 Management— Bldg 360, Rm A-224

10:00 am **Break – Bldg 362, Rm E-148**

10:15 am Subcommittee Breakout Sessions
- Continued in same rooms as 8:00 am Sessions

12:30 pm **Lunch – Bldg 362, Rm E-148**

1:30 pm Three Options – D. Lehman to choose Wednesday morning:
1. Full Committee Session with NOvA Management
2. Tour of NOvA work, Building 366, Full Committee plus Level 2 Managers (30minutes total).....D. Ayres
3. Continued Breakout Sessions

2:30 pm Subcommittee Working Session

3:00 pm DOE Full Committee Executive Session—**Bldg 360, Rm A-224** .....D. Lehman

6:00 pm Adjourn

Thursday, October 25, 2007

8:00 am Subcommittee Working Session

10:00 am DOE Full Committee Executive Session Dry Run—.....D. Lehman
Bldg 360, Rm A-224

12:00 pm Working Lunch

2:00 pm DOE Summary and Closeout—**Bldg 362, Auditorium**.....D. Lehman

3:00 pm Adjourn

U.S. Department of Energy

Office of Science

Report Outline/Writing Assignments

Executive Summary ..... Tkaczyk

1. Introduction ..... Procario
2. Technical
   - 2.1 Commodities (Charge Questions 1, 3) ..... Hahn/Subcommittee 1
     - 2.1.1 Findings
     - 2.1.2 Comments
     - 2.1.3 Recommendations
   - 2.2 PVC Extrusion Module and Near/Far Detector Assembly ..... Wisniewski/Subcommittee 2
   - 2.3 Electronics and Data Acquisition ..... Lankford/Subcommittee 3
   - 2.4 Accelerator and Beamlines ..... Gerig/Subcommittee 4
3. Sites and Buildings (Charge Questions 3, 5) ..... Lawson/Subcommittee 5
4. Environment, Safety and Health (Charge Questions 3, 6) ..... Trotter/Subcommittee 6
5. Cost Estimate (Charge Questions 2, 3) ..... Thibideau/Subcommittee 7
6. Schedule and Funding (Charge Questions 2, 3) ..... Thibideau/Subcommittee 7
7. Management (Charge Questions 3, 4) ..... Gilchriese/Subcommittee 8

U.S. Department of Energy

Office of Science

Summary Assessment of the NOνA EIR Elements

EIR Element	Sub-committee	SC Review Team Assessment	Comment
1. Resource Loaded Schedule	**LEAD**: **Thibideau** **SC-7**	Satisfactory Satisfactory with Comment Unsatisfactory	For selected Work Breakdown Structure elements (typically, those constituting significant cost and/ or risk), summarize the detailed basis for the cost estimate and schedule duration. Assess the method of estimation and the magnitude for each WBS element reviewed. Identify and assess key cost and schedule assumptions and evaluate the reasonableness of these assumptions as related to the quality of the cost and schedule estimates. Identify specific work activity that constitutes project completion and whether these completion activities are sufficiently well defined. Include an assessment of whether the project completion activities are consistent with DOE guidance for work to be included/ excluded from the project. Assess whether the project funding profile is consistent with the resource loaded schedule. **Project Response**: **Committee Response**:
2. Key Project Cost and Schedule Assumptions	**LEAD**: **Thibideau** **SC-7**		Identify and assess key cost and schedule assumptions and evaluate the reasonableness of these assumptions as related to the quality of the cost and schedule estimates for each WBS. Assess cost and schedule contingency and other cost and schedule factors related to TPC and the project completion schedule. Ensure that the TPC and project completion date incorporates all activities necessary to successfully complete the project.
3. Critical Path	**LEAD**: **Thibideau** **SC-7**		Review the Critical Path schedule and assess whether the Critical Path is reasonably defined and whether the schedule is integrated and reflects reasonable schedule durations.
4. Funding Profile	**LEAD**: **Thibideau** **SC-7**		Assess whether the project funding profile is consistent with the resource loaded schedule.

U.S. Department of Energy

Office of Science

Summary Assessment of the NOνA EIR Elements

EIR Element	Sub-committee	SC Review Team Assessment	Comment
5. Work Breakdown Structure	**LEAD**: **Thibideau** **SC-7**		Assess whether the Work Breakdown Structure incorporates all project work, and whether it represents a reasonable breakdown of the project work scope. Assess whether the resource loaded schedule is consistent with Work Breakdown Structure for the project work scope.
6. Risk Management	**LEAD**: **Gilchriese** **SC-7/8**		Determine if risks have been identified and properly classified as high, medium, and low. Assess whether appropriate risk mitigation actions have been incorporated into the baseline. Assess whether adequate contingency has been included in Total Project Costs and Schedule. Describe the approaches used to determine risk and assess adequacy.
7. Basis of Design	**LEAD**: **Gilchriese** **SC-1/2/3/4/5**		Evaluate adequacy of preliminary design including adequacy of drawings and specifications, and assess whether they are consistent with system functions and requirements. Assess whether all safety Structures, Systems, and Components (SSCs) are incorporated into the preliminary design.
8. Design Review	**LEAD**: **Gilchriese** **SC-1/2/3/4/5**		Review results of the preliminary design review and assess whether additional work identified in the design review has been incorporated into the Performance Baseline.
9. System Functions and Requirements	**LEAD**: **Gilchriese** **SC-1/2/3/4/5**		Assess whether "design to" functions and requirements are reflected in the baseline, including safety and external requirements such as permits, licenses, and regulatory approvals. Evaluate whether system requirements are derived from and consistent with Mission Need.
10. Hazards Analysis	**LEAD**: **Trotter** **SC-6**		Evaluate the quality of the Hazard Analysis and assess whether all scope, schedule, and costs necessary for safety are incorporated into the baseline. Review the classification of SSCs as safety class or safety significant. Assess the Hazards Analysis process, including the use of internal and external safety reviews. Review any Defense Nuclear Facilities Safety Board and/or Nuclear Regulatory Commission interface and discuss the status of their involvement.

U.S. Department of Energy

Office of Science

Summary Assessment of the NOνA EIR Elements

EIR Element	Sub-committee	SC Review Team Assessment	Comment
11. Value Management/Engineering	**LEAD: Gilchriese** **SC-1/2/3/4/5**		Assess the applicability of Value Management/Engineering, and whether a Value Engineering analysis been performed with results being incorporated into the baseline. Also provide an assessment of the Value Engineering process for this project.
12 Project Controls/EVMS	**LEAD: Thibideau** **SC-7/8**		Assess whether all project control systems and reporting requirements will be in place prior to Critical Decision-2. For projects where Earned Value Management System is not required, assess the adequacy of an alternate project control system for monitoring and controlling project costs and schedules.
13. Project Execution Plan	**LEAD: Gilchriese** **SC-8**		Review the Project Execution Plan and determine if it reflects and supports the way the project is being managed, is consistent with the other project documents, and establishes a plan for successful execution of the project.
14. Start-up Test Plan	**LEAD: Gilchriese** **SC-1/2/3/4/5**		Assess whether the start-up test plan identifies the acceptance and operational system tests required to demonstrate that system meets design operational specifications, and safety requirements. Review key tests to ensure that sufficient description is provided to estimate cost and schedule durations associated with these tests.
15. Acquisition Strategy	**LEAD: Gilchriese** **SC-8**		Review the Acquisition Strategy to determine if it is consistent with the way the project is being executed. The Review Team should evaluate any changes from Critical Decision-1 that may impact whether the current strategy represents best value to the government.
16. Integrated Project Team	**LEAD: Gilchriese** **SC-8**		Assess whether the project management staffing level is appropriate, and determine if appropriate disciplines are included in the Integrated Project Team. Identify any deficiencies in the Integrated Project Team that could hinder successful execution of the project.

U.S. Department of Energy

Office of Science

NOvA Cost Estimate

	WBS	Items	NOvA 's Cost Estimate AY $M									
			Estimated Cost (with indirects)			Contingency Estimate			Contingency %			Total Cost
			M&S	Labor[1]	Total	M&S	Labor[1]	Total	M&S	Labor[1]	Total	
TEC	2.0	Accelerator & NuMI Upgrades	$ 10.1	$ 18.6	$ 28.7	$ 3.5	$ 6.2	$ 9.7	35%	33%	34%	$ 38.4
	2.1	Far Detector Site and Building	$ -	$ 2.2	$ 2.2	$ -	$ 0.3	$ 0.3	0%	14%	14%	$ 2.5
	2.2	Liquid Scintillator	$ 19.3	$ 0.4	$ 19.6	$ 5.3	$ 0.2	$ 5.5	27%	54%	28%	$ 25.1
	2.3	Wave-Length-Shifting Fiber	$ 9.6	$ 0.9	$ 10.5	$ 2.7	$ 0.1	$ 2.8	28%	10%	27%	$ 13.3
	2.4	PVC Extrusions	$ 24.9	$ 1.7	$ 26.6	$ 6.8	$ 0.6	$ 7.4	27%	35%	28%	$ 34.0
	2.5	PVC Modules	$ 6.3	$ 3.8	$ 10.1	$ 1.5	$ 1.3	$ 2.7	23%	33%	27%	$ 12.9
	2.6	Electronics Production	$ 11.4	$ 0.9	$ 12.3	$ 3.7	$ 0.3	$ 4.1	33%	35%	33%	$ 16.3
	2.7	Data Acquisition System	$ 1.7	$ 1.8	$ 3.5	$ 0.5	$ 0.5	$ 1.0	27%	29%	28%	$ 4.5
	2.8	Near Detector Assembly	$ 3.7	$ 0.5	$ 4.2	$ 3.4	$ 0.3	$ 3.8	94%	57%	90%	$ 7.9
	2.9	Far Detector Assembly	$ 5.7	$ 5.7	$ 11.4	$ 3.7	$ 3.8	$ 7.5	65%	66%	66%	$ 18.9
	2.10	Project Management	$ 0.5	$ 4.1	$ 4.6	$ 0.1	$ 1.0	$ 1.2	25%	25%	25%	$ 5.8
		Management Reserve										$ 0.6
		Subtotal Construction	**$ 93.1**	**$ 40.7**	**$ 133.7**	**$ 31.2**	**$ 14.7**	**$ 45.8**	**33%**	**36%**	**34%**	**$ 180.2**
OPC		**R&D - Accelerator**	$ 2.0	$ 7.2	$ 9.2	$ 0.6	$ 2.5	$ 3.0	29%	34%	33%	$ 12.2
		R&D - Detector	$ 5.2	$ 4.8	$ 10.1	$ 0.4	$ 0.5	$ 0.9	8%	10%	9%	$ 11.0
		Cooperative Agreement	$ 45.0	$ -	$ 45.0	$ 9.9	$ -	$ 9.9	22%	0%	22%	$ 54.8
		Operating	$ 0.2	$ 1.0	$ 1.2	$ 0.1	$ 0.4	$ 0.5	34%	42%	41%	$ 1.7
		Total OPC:	**$ 52.4**	**$ 13.1**	**$ 65.5**	**$ 10.9**	**$ 3.4**	**$ 14.3**	**21%**	**26%**	**22%**	**$ 79.8**
		TPC:	**$ 145.4**	**$ 53.8**	**$ 199.2**	**$ 42.1**	**$ 18.1**	**$ 60.2**	**29%**	**34%**	**30%**	**$ 260.0**

Notes:

[1] Labor costs presented here include all project labor from Fermilab, other DOE facilities and Universities.

U.S. Department of Energy

Office of Science

Closeout Presentation and Final Report Procedures

U.S. Department of Energy

Office of Science

Format: Closeout Presentation

2.1 [Use number and title corresponding to writing assignment list.]

List Review Subcommittee Members

EIR Lines of Inquiry and Responses

7. Basis of Design. [Provide short response to each assigned line of inquiry.]

2.1.1 Findings

- In bullet form, include an assessment of technical, cost, schedule, and management.

2.1.2 Comments

- In bullet form, list descriptive material assessing the findings and the conclusions based on the findings. This is narrative material and is often omitted as a separate heading and the narrative included either under Findings or Recommendations as appropriate. This heading carries more emphasis than the Findings, but does not require an action as do the Recommendations. Do not number your comments.

2.1.3 Recommendations

1. **Begin with action verb.**
2.

Format: Final Report

2.1 [Use number and title corresponding to writing assignment list.]

2.1.1 Findings

Include an assessment of technical, cost, schedule, and management.

2.1.2 Comments

Descriptive material assessing the findings and the conclusions based on the findings. This is narrative material and is often omitted as a separate heading and the narrative included either under Findings or Recommendations as appropriate. This heading carries more emphasis than the Findings, but does not require an action as do the Recommendations. Do not number your comments.

2.1.3 Recommendations

1. Begin with action verb.

2.

3.

The EIR Lines of Inquiry will be included as an appendix to the final report.

U.S. Department of Energy

Office of Science

Expectations

- Present the closeout report in PowerPoint.
- Forward your written section of the review report (in MSWord format) to Casey Clark, casey.clark@science.doe.gov,

  by Monday, October 29, 8:00 a.m. (EDT).